Ain Shams University
Faculty of Medicine
Department of Anesthesiology,
Intensive Care and Pain Management

Peri Operative Management Of Morbid Obese Patients Undergoing Non-Bariatric Major Surgery

An Essay
Submitted in Partial Fulfillment of the Master's Degree in Anesthesia
By

Ahmed Nasr Shazly Hafez
(MB, BCh)

Under Supervision of

Prof. Dr. Azza Yousef Ibrahim
Professor of Anesthesiology, Intensive Care and Pain Management
Faculty of Medicine, Ain Shams University

Prof. Dr. Adel Mikhael Fahmy
Professor of Anesthesiology, Intensive Care and Pain Management
Faculty of Medicine, Ain Shams University

Dr.Wael Sayed Abd Elghaffar
Lecturer in Anesthesiology, Intensive Care and Pain Management
Faculty of Medicine, Ain Shams University

Ain Shams University
Faculty of Medicine
2016

First of all, I thank Allah for blessing this work until it has reached its end, as a part of his generous helping throughout my life.

I would like to express my deep gratitude and appreciation to ***Prof. Dr. Azza Yousef Ibrahim Ahmed,*** *Professor of Anesthesiology and Intensive Care Medicine, Faculty of Medicine, Ain Shams University for her continuous support and supervision.*

I would also like to express my gratitude to ***Prof. Dr. Adel Mikhael Fahmy,*** *Professor of Anesthesiology and Intensive Care Medicine, Faculty of Medicine, Ain Shams University for his continuous support and supervision.*

I would also like to express my gratitude to ***Dr. Wael Sayed Abd Elghaffar,*** *Lecturer of Anesthesiology and Intensive Care Medicine, Faculty of Medicine, Ain Shams University, for his continuous support and supervision.*

Finally, I dedicate this effort to ***My family,*** *who helped me in every moment of my life. Also I dedicate this work to my wife and my son, Moaaz.*

Ahmed Nasr Shazly Hafez

Aim of the work

The aim of the work is to discuss the pathophysiology of morbid obesity and to review the anesthetic implications of major operations.

List of Abbreviations

ADH	Antidiuretic hormone
AHA	American heart association
a–a	Alveolar–arterial
AE	adverse events
AF	Atrial fiberllation
AHI	Apnea hypopnea index
APAP	Autoadjusting positive airway pressure
ASA	American society of anesthesiologists
BEE	Basal energy expenditure
BiPAP	Bilevel positive airway pressure
BIS	Bispectral index
BMI	Body mass index
CC	Closing capacity
CF	Cardiac failure
CHD	Congestive heart disease
CI	Cardiac index
CO_2	Carbon dioxide
CBW	Corrected body weight
CPAP	Continuous positive airway pressure

CPEX	Cardiopulmonary exercise testing
CSCF	Clinical Services Capability Framework
DM	Diabetes mellitus
DMV	Difficult mask ventilation
DVT	Deep venus thrombosis
DXA	Dual-energy radiographic absorptiometry
ECG	Electrocardiography
EI	Energy intake
EIT	Electrical impedance tomography
ERV	expiratory reserve volume
$EtCO_2$	End-tidal CO_2
FVC	Functional volume capacity
FRC	Functional residual capacity
GERD	Gastro-esophageal reflux disease
GLP-1	Glucagon like peptide-1
HELP	Head elevated laryngoscopy position
IAP	Intra-abdominal pressure
IBW	Ideal body weight
ICU	Intensive care unit
IDDM	Insulin dependent diabetes mellitus
IHD	Ischemic heart disease
IPC	Intermittent pneumatic compression devices

IVC	Inferior vena cava
JVP	Jugular venous pressure
LAD	Left atrial dillatation
LBW	Lean body weight
LV	Left ventricle
LAGB	Laparoscopic adjustable gastric banding
MAC	Minimal alveolar concentration
MAP	Mean arterial blood pressure
NASH	Non-alcoholic steatohepatitis
NC	Neck circumference
NIPPV	Non-invasive positive pressure ventilation
NMBA	Neuro muscular blocking agents
N_2O	Nitrous oxide
NPO	Nothing by mouth
NSAID	Nonsteroidal anti-inflammatory drug
OHS	Obesity hypoventilation syndrome
OSA	Obstructive sleep apnea
PAP	Positive airway pressure
PACU	Postoperative anesthesia care unit
P_aCO_2	Arterial carbon dioxide tension
PE	Pulmonary embolism
PFTs	Pulmonary function tests

PONV	Postoperative nausea and vomiting
P-SAP	Perioperative sleep apnea prediction score
PSG	Polysomnography
REM	Rapid eye movement
RSI	Rapid sequence induction
RV	Residual volume
S_aO_2	Arterial oxygen saturation
SVR	Systemic vascular resistance
TAP	Transversus abdominal plane
TBW	Total body weight
TEE	Transesophageal echocardiography
TIVA	Total intravenous anesthesia
TLC	Total lung capacity
TMD	Thyromental distance
TSH	Throid stimulating hormone
VC	Vital capacity
$\dot{V}O_2$	Maximum oxygen uptake
$\dot{V}/\dot{Q}$	Ventilation/perfusion ratio
VD	Volume of distribution
WHO	World health organization

List of Tables

List of Figures

Contents

Introduction

Definition

As defined by the WHO, overweight and obesity are characterized by an abnormal or excessive fat accumulation that presents a risk to health ***(Huschak et al., 2013).***

In the United States of America, Obesity is a major public health disaster and in the rest of the developed world. In many developed nations worldwide, the incidence is rising rapidly. This increasing rate represents a pandemic that needs urgent attention if obesity's possible toll on morbidity, mortality, and financial side is to be avoided. Research into the complex physiology of obesity may assist in avoiding this impact.

The annual cost of managing obesity in the United States of America amounts to approximately one billion and ninety dollars per year, or twenty percent of national health expenditures, according to a recent study**. (*Cawley et al., 2012)***

The major aim for the anesthetist is to provide safe perioperative care without at all morbidity or mortality for the procedure in morbidly obese patients. To achieve this all the team members should be aware of the morphological, physiological and other systemic pathological changes in obese patients. ***(Trus et al., 2005).***

Aim of the work

The aim of the work is to discuss the pathophysiology of morbid obesity and to review the anesthetic implications of major operations.

Pathophysiology of obesity

Classification of obesity

Obesity is a condition of excess of body fat and overweight is an excess of body weight for height. Normal, healthy women have a percentage of approximately 25-30% and healthy men have a body fat percentage of 15-20%. ***(Gallagher et al., 2000).***

The body mass index (BMI), which is identified as the Quetelet index, calculated as weight/height^2, with weight being in kilograms and height being in meters (otherwise, the equation is weight in pounds 0.703/height in inches^2):

a) WHO international classification of adult underweight, overweight and obesity according to BMI is as follows:

Classification	BMI(kg/m2)	
	Principal cut-off points	Additional cut-off points
Underweight	<18.50	<18.50
Severe thinness	<16.00	<16.00
Moderate thinness	16.00 - 16.99	16.00 - 16.99
Mild thinness	17.00 - 18.49	17.00 - 18.49
Normal range	18.50 - 24.99	18.50 - 22.99
		23.00 - 24.99
Overweight	≥25.00	≥25.00
Pre-obese	25.00 - 29.99	25.00 - 27.49
		27.50 - 29.99
Obese	≥30.00	≥30.00
Obese class I	30.00 - 34.99	30.00 - 32.49
		32.50 - 34.99
Obese class II	35.00 - 39.99	35.00 - 37.49
		37.50 - 39.99
Obese class III	≥40.00	≥40.00

Table 1:Cut-offs for BMI-classes represents traditional values in the American and European population.***(Shiwaku et al 2004).***

b) Physical Status Classification

Obese patients are classified by The American Society of Anesthesiologists (ASA) as ASA II and those with organ dysfunction (eg. hypertention) are classified as ASA III

It should be noted that the ASA principal cut off points for BMI classification are slightly different to the WHO international classification as follows: